

# Grand Sable Dunes

## Research Natural Area

Pictured Rocks National Lakeshore  
National Park Service  
U.S. Department of the Interior



“Wild Beauty on the Lake Superior Shore”

### Where Can I See the Dunes?

The best place to view the Grand Sable Dunes is from the trail that begins at the west end of the Sable Falls parking area. This trail leads through an old field, then crosses a bridge over Sable Creek. It then ventures into the forest and dunes transition area for approximately 1/4 mile. Wayside exhibits are located along the trail.

Another access point for the dunes is from the North Country Trail 1/4 mile east of the Log Slide. Please stay on the trail in both of these areas as the dunes vegetation is fragile.

### Dunes Preserved as Research Area

The Grand Sable Dunes are among the best examples of perched dune systems in the world. A large portion of the dunes is preserved in the Grand Sable Dunes Research Natural Area (RNA). The RNA was designated by the Lakeshore in 1994. Research Natural Areas are part of a national network of field ecological areas designated for research and education and to maintain biological diversity. They are set aside to provide scientists with a permanent tract on which there will be minimal interference in the conduct of needed research; interpretation will be provided primarily off-site.

The Grand Sable Dunes Research Natural Area is located 3.5 miles west of Grand Marais, MI adjacent to and north of Alger County Highway H-58. The research area comprises 2.8 square miles, the major portion of an active perched dune field along Lake Superior within the extreme eastern portion of Pictured Rocks National Lakeshore. The RNA consists of two units; the western unit is approximately 1630 acres, while the eastern unit is approximately 200 acres.

The perched dune field of the RNA includes areas of active sand deposition/deflation and interdunal areas in various stages of stabilization. The dunes support open, sparse plant communities as well as patches of jack pine forest. Plant succession has been periodically interrupted by sand deposition/deflation. Bordering the dunes to the south, east, and west is second growth northern hardwood forest.

### Native Americans

The “Gitchee Nagow” (Great Sands) figured prominently in Ojibwa legend and were reportedly a traditional site of fasting stations which played a key role in religious ceremonies at important points in Ojibwa life. Early accounts of “les Grandes Sables” by lake travellers, beginning with Radisson and Groseillers in 1658, are well known. No known historic sites, per se, are present in the RNA.



### Climate

The Grand Sable Dunes have a humid continental climate. Winters are long and cold, and summers are short and cool; the growing season averages 107 days annually. The dunes are in the second most cloudy region of the United States, with an annual mean cloud cover of 70%. The average annual temperature for Grand Marais is 40.8 degrees F. Precipitation totals about 31 inches per year with maximum amounts occurring during the summer. About 32% of the area’s precipitation falls as snow; total accumulation of snow ranges from 130 to 200+ inches. The proximity of Lake Superior prevents extreme low temperatures in winter and extreme warm temperatures in summer.

### Glacial History

During the Pleistocene epoch, ice sheets of several North American glacial stages advanced and retreated through the area. The final major stage of the Great Lakean glaciation completed its advance just southeast of the Green Bay, WI about 11,500 years ago. A brief re-advance, the Marquette substage, occurred about 10,000 years ago in northern Upper Michigan.

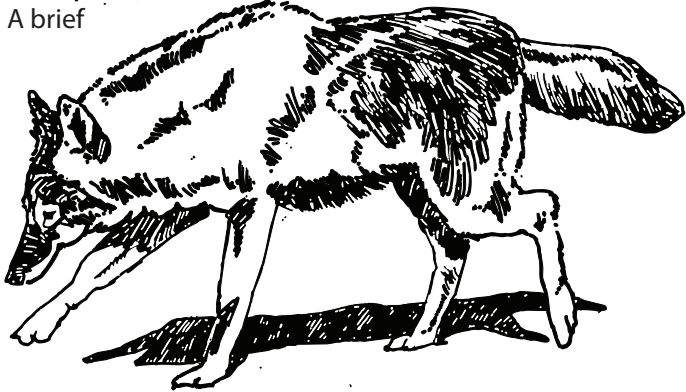
Melting of glacial ice within the Superior Basin produced huge rivers that deposited millions of tons of pulverized rock rubble in various configurations to the south of the Superior basin. The Grand Sable Banks may have originated as a glaciofluvial kame terrace along one of these glacial rivers during deglaciation.

As ice retreated completely from the Superior Basin, water levels in the basin receded rapidly northward leaving the Pictured Rocks area “high and dry”

about 9500 years ago. This occurred as outlet channels to the east remained at low levels due to the recent loading of glacial ice. Near the present site of Grand Marais, a north facing ice contact bluff and platform south of it became forested and remained stable for 4500 years after deglaciation.

Between 6,000 and 4,000 years before present, rebound of the earth’s crust from its “depressed” state began to accelerate as land was relieved of the huge weight of the ice sheets. The rise of the outlet of ancestral Lake Superior at North Bay, Ontario, caused lake level to rise relatively quickly to a level roughly 40 feet higher than present Lake Superior, forming glacial Lake Nipissing.

As levels of Lake Nipissing rose, the Grand Sable Banks were destabilized and formed a north facing active colluvial slope. Unconsolidated sand on this slope was entrained by predominant northwesterly winds and deposited on the plateau top to form the Grand Sable Dunes.



No permanent lakes or streams occur within the RNA. Several seeps and springs issue from the base of the Grand Sable Banks where ground water is concentrated by an impervious sedimentary layer.

No soil profile development can be observed in modern surface deposits.



Several paleosols buried at different times over the past 5,000 years are present and reflect paleoecological conditions over that time period. Most are not readily seen by the casual observer.

The most abundant large mammals in the vicinity of the RNA are the white-tail deer and black bear. A deer yard is located northeast of Grand Sable Lake and a few deer usually winter in jack



pine patches in the eastern portion of the dunes. Bald eagle soar in the area and common harriers drift over the open stretches.

Dune grass, Lake Huron tansy, jack pine, and balsam poplar are common in the dunes. More uncommon residents (and protected by law) include Pitcher’s Thistle, grape ferns, orchids, are found here as well.

Geomorphic Dynamism

Research has shown that lake level changes, wind and wave regimes are drivers of geomorphic change and that this change has influence on coastal vegetation patterns. Many rare or relict plant communities and species occur in unusual habitats within the coastal zone. Fluctuating lake levels have built and destroyed time synchronized sites some of which have been utilized in studies of plant succession and rates of soil formation. From studies of plant assemblages on the dunes it has been suggested that the fates of several rare species are tied to specific disturbance regimes within a shifting habitat mosaic. These demographic characteristics of small, isolated populations in highly dynamic landscape patches are keys to species persistence over time.

Some paleoecological work has suggested that landscape disturbance regime is altered by climatic shifts and species composition in a complex way. Disturbance regimes may undergo step-like shifts that cause rapid change in vegetation as climate varies gradually over time. This suggestion is central to

questions about linkage of vegetation patterns and climate.

That habitats and disturbance regimes on the Grand Sable Dunes plateau have changed drastically in the past is witnessed by the presence of “ghost forests” of apparent various age within the dune field and charcoal fragments associated with several ancient soils.

Studies of fire history, rare plant distribution, soils, forest ecology and geomorphology of the dune field and northern hardwood and conifer forests surrounding it suggest that many drivers of landscape dynamism interact in the dunes. This complex interaction produces distinctive patterns of community types, species richness, and patch turnover within a relatively small area. Climate and Lake Level Changes

History and mechanisms of change in levels of the Great Lakes have been investigated on several scales. Major episodes of high and low water have been identified through beach ridge studies. Finer scale late Holocene changes are not well understood, particularly on Lake Superior.

It has been hypothesized that sand supply to the Grand Sable Dunes decreases during periods of stable or lowering lake levels because of diminished basal sapping and armoring of the upper slope through exposure of coarse fragments; dune building episodes are the result of rising lake level. More recent soil stratigraphy work supports this hypothesis. One widespread and well developed paleosol and several other buried soils of local extent are present in the dunes. The Grand Sable system represents one of the few areas in the northern Great Lakes where buried soils are preserved and material is available for radiocarbon dating. It appears that evidence of fine scale changes in the levels of Lake Superior are present in the dunes.

A basic illustration of this process:



Lake Superior levels high - the base of the banks are de-stablized by lake erosion. Plants and soils are buried by sand that blows to top of dunes.



Lake Superior levels low with little basal erosion - dunes are stablized by vegetation as little new sand is blown on top.



Lake Superior levels high - base of banks are de-stablized by lake erosion. Plants and soils are again buried by wind-driven sand.

For additional information, visit : [www2.nature.nps.gov/geology/tour](http://www2.nature.nps.gov/geology/tour)

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